

# **Salt River Fire Department Operating Guidelines**

## **Five Star Alarm Portable Gas Detector**

**December 2003**

**208.01B**

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### **PURPOSE**

The purpose of this operating guideline is to establish the highest level of accuracy for atmospheric monitoring instruments. This will allow the user and field personnel to operate in high levels of instrument accuracy. This ongoing methodology for spanning and calibrating of atmospheric monitoring instruments should ensure the highest level of safety for all personnel.

### **RESPONSIBILITIES**

It shall be the responsibility of all members and supervisors to know this procedure and how to span and/or calibrate these devices.

### **PROCEDURE FOR STORAGE AND RESPONSE**

The Salt River Fire Department currently possesses four (4) Five Star hazardous gas detectors. These detectors shall be stored in operating condition in the Captains office at station 292. The detectors shall be kept on chargers while not in use. When detectors are requested on an incident they are to be removed from charger, spanned, and placed into storage boxes provided. When these detectors are requested to an incident all four (4) shall be taken to the scene. Detectors shall also be spanned weekly and logged as described below.

### **SPANNING**

Spanning and/or calibration shall be done on each instrument (except RMD\* instruments) prior to making entry into the following atmospheres:

- Contaminated atmospheres
- Atmospheres, which may suddenly become contaminated
- Atmospheres where there is suspected oxygen deficiency
- Atmospheres, which are suspected, of being contaminated or oxygen deficient at any other time it may be necessary to render an instrument in a ready state of condition.

This instrument will be spanned on the proper calibration gas, hose and regulator to ensure the instrument of choice is in proper operating condition. At any time the instrument does not span

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correctly, and you cannot resolve the problem, you will not use the instrument. You will then send the instrument to the Battalion Chief for calibration.

### PROCEDURE FOR SPANNING

This calibration check is very simple and should only take one to five minutes; depending on the number and type of gases your Five Star Alarm is equipped to sense. Turn the Five Star Passport ON in clean fresh air, and verify that the readings indicate no gas present

1. Attach pump module to the Five Star Alarm
2. Attach the calibration adapter to the pump module.
3. Attach the regulator (supplied with the calibration kit) to the cylinder.
4. Connect the black tubing supplied with the calibration kit to the regulator.
5. Connect the other end of the tubing to the inlet fitting. The pump will open the valve on the regulator.

The flow rate of the regulator is 0.25 LpM. Note the readings on the Five Star display; they should be within the limits stated on the calibration. If the readings are not within these limits, the Five Star Alarm requires recalibration.

### TRACKING

To keep track of all the spanning and calibration being performed on all atmospheric monitoring instruments, a Control Log have been developed. It is called the "Five Star Calibration and Span Control Log." This Control Log will be used to document weekly calibration and spanning being done prior to the use of the instruments. The form will be completed on a monthly basis and forwarded to the Battalion Chief. Calibration of instruments shall be on a weekly basis to ensure proper maintenance is being performed on all instruments, according to manufacturer's recommendations This Control Log file shall act as a legal history of that instrument's performance.

### CALIBRATION

The Auto calibration sequence resets the instrument zeroes and adjusts the sensor calibration for known concentration of calibration gases. Auto calibration is standard on Five Star Alarms when factory-shipped with any combination of the following sensors:

- To access Auto calibration, press and hold the **RESET** button for three seconds.
- Auto Cal? Display appears.

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- Press the **RESET** (YES) button to start the Auto calibration sequence.
- The instrument display indicates that it is adjusting zeroes.

**NOTE:** During the Auto calibration zero procedure, the limits on the zero adjustments present during the Fresh Air Setup option are eliminated.

**NOTE:** For auto calibration, all gases must be in one cylinder.

- After zeroes are adjusted, the instrument prompts the user to apply calibration gas and to cycle through the gas readings one-at-a-time for 90 seconds.
- If the Auto calibration sequence has passed; the instrument briefly displays a screen reminding the user to remove the calibration gas.
- The instrument then automatically returns to the Measure Gas mode.

**NOTE:** The auto calibration procedure adjusts the span value for any sensors that pass the test. Sensors that fail auto calibration are left unchanged.

**NOTE:** Since residual gas may be present, the instrument may briefly go into an exposure alarm after the calibration sequence is completed.

- If Auto calibration span sequence fails, the display appears.
- To view which sensor(s) failed, press **ON/OFF** (SHOW) button.
- Instrument displays the expected gas values and displays if sensor reading was:
  - OK
  - LOW or
  - HIGH.

If a sensor fails the calibration, then send the instrument to the Battalion Chief for repairs.

### **ON SCENE USE- Confined space, Overhaul, Odor check or smell of gas**

#### **CONFINED SPACE**

Hazard Sector shall do atmospheric testing in the space to determine oxygen level, flammability, and toxicity. Based on readings, Hazard Sector should advise Command of the proper level of personal

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protective equipment. Five star hazardous gas detectors shall have the following settings preset for Audio-alarm activation.

- O2 19.5%, low ad O2 enriched 23.5%
- Flammability 10% alarm set
- Toxicity carbon monoxide 35 PPM
- Hydrogen sulfide 10 PPM

Any O2 readings below 12%, Command should recognize that the LEL reading would not be accurate. Hazard Sector shall give Command atmosphere readings at least every 5 minutes with an announcement of offensive or defensive mode (i.e., rescue or recovery).

The Hazard and Ventilation Sectors are extremely important parts of a confined space operation. Personnel with thorough knowledge of atmospheric monitoring and ventilation technique should staff them.

### **SMELL OF GAS, ODOR CHECKS**

Check areas systematically using combustible gas indicators. Start outside of the area of odor, and move into the area until readings indicate detectable concentration. Map the readings for the affected area. If a gas concentration is encountered inside, adjacent to, or underneath any building, secure all possible sources of ignition in the affected area. Cut electricity from outside the affected area to avoid arcing. Ventilate buildings where gas is found with explosion proof equipment only. The use of ground probes is essential to evaluate potential underground leaks. When gas company personnel are on the scene, ground probe readings and locations must be coordinated. Time, location, and concentration should be recorded for each probe--subsequent readings should be taken from same holes when possible.

### **OVERHAUL**

The Five star hazardous gas detectors can be used during the overhaul, salvage and investigation mode of a fire incident. The interior of a building may be checked for Carbon Monoxide, Oxygen deficient, and flammable gasses. If No gasses are found and Oxygen levels are normal crews may remove protective breathing apparatus. If this is done each individual crew supervisor shall be equipped with a gas detector so to continually monitor the air, which crews are working. If any readings are found during this time all crews will be removed and placed back into full protective equipment.

### **DEFINITIONS**

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**Spanning**- also known as Bump testing- the process of using the calibration gasses to check the calibration of the detector.

**Calibration**- The process of resetting the values for each sensor in the detector.

**RMD**- Radiological Monitoring Devices

**IDLH** (Immediately Dangerous to Life and Health)\*-The maximum concentration level of a substance (gas) from which a worker could escape within 30 minutes without developing immediate, severe or irreversible health effects, or other escape-impairing symptoms. IDLH levels are measured in PPM (parts per million). \*As defined by NIOSH (National Institute for Occupational Safety and Health).

**PEL** (Permissible Exposure Limit)-An airborne concentration of contaminant that most workers can be exposed to repeatedly in a normal 8- hour day, in a 40-hour week, without adverse health effect. PEL levels are measured in PPM (parts per million) and are established by OSHA.

**PPM** (Parts Per Million)-The most common unit of measurement for toxic gases. "10,000 parts per million "gas concentration equals 1%by volume.

**TLV** (Threshold Limit Value)\*-Refers to the airborne concentration of substances to which most workers can be repeatedly exposed over a working lifetime without adverse effects.

There are three categories of TLVs:

**TLV –TWA** -(Time Weighted Average)-This is the average amount of gas that a worker can be repeatedly exposed to in a normal 8-hour day, in a 40-hour week, without adverse health effects.

**TLV – STEL** -(Short Term Exposure Limit)-The gas concentration that most workers can be continuously exposed to for a 15-minute time period without suffering adverse health affects that would impair self-rescue or worker

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safety. This limit should not be repeated more than 4 times per day and there should be at least 60 minutes between individual STEL exposure periods.

**TLV – C** - (Ceiling)–The highest gas concentration to which workers may be exposed. Ceiling TLV's should never be exceeded and they take precedence over all TWA's and STEL's.

**LEL** - (Lower Explosive Limit)–The lowest concentration of a gas or vapor that will ignite and sustain combustion. “%LEL” is a common unit of measurement in combustible gas detection.

**UEL**- (Upper Explosive Limit)–The maximum concentration at which a gas will sustain combustion.

**Oxygen Deficient Atmosphere** –An atmosphere containing less than 19.5% oxygen by volume.  
(Possesses a risk of insufficient oxygen for breathing.)

**Oxygen Enriched Atmosphere** –An atmosphere containing more than 25% oxygen by volume.  
(Possesses an increased risk of explosion.)